REMARKS

This Amendment responds to the Office Action dated December 30, 2009, in which the Examiner rejected claims 1-22. In response to the rejection, applicants have amended claims 1, 3, 21, and 22. Reconsideration and reexamination are respectfully requested in view of the foregoing amendments and the following remarks.

The §112 Rejections

The Examiner has rejected claim 3 under 35 U.S.C. §112, first paragraph, saying that the claim lacks enablement as presented, and suggests that claim 3 appears to contain an obvious typographical error, as confirmed by claim 14 and page 4, line 20 of the specification. Applicants thank the Examiner for pointing out this inadvertent typographical error, which applicants have corrected by amending claim 3. Applicants submit that the rejection of claim 3 for alleged lack of enablement may now be withdrawn.

The Examiner has rejected claims 1, 12, and the claims dependent thereon under 35 U.S.C. §112, first paragraph, as allegedly being indefinite in stating in claims 1 and 12, "a substantial part." The Examiner interprets this as meaning that "the Mg and Si in the sheet metal alloy are present as separate Mg_2Si and S particles to prevent artificial ageing." In response, applicants confirm the Examiner's understanding of "substantial part" is correct, and that claims 1 and 12 as thus understood comply with 35 U.S.C. §112, second paragraph. Applicants submit that the rejection may now be withdrawn.

The §102/ §103 Anticipation/Obviousness Rejections

The Examiner has also rejected claims 1-2 as anticipated by or obvious in view of Warblicher. The Examiner contends that Warblicher teaches an extruded AlMgSi component, which is subjected to heat treatment to form fine particle precipitates of Mg and Si thus providing a sheet having improved processability. The Examiner contends that Warblicher would anticipate the limitation that the Mg and Si are present as claimed particles to prevent artificial ageing, or in the alternative that any differences between Warblicher and the claimed invention are minor and would be obvious. The Examiner also states that Warblicher teaches a composition that overlaps claim 2.

The Examiner has also rejected claims 1 and 2 as anticipated by or alternatively obvious over Gulotti. The Examiner asserts that Gulotti teaches an AlMgSi billet containing Mg_2Si particles, and thus would anticipate the limitation that Mg and Si are present as the claimed particles to prevent ageing. The Examiner also contends that the difference between Gulotti and the claimed invention are minor and would have been obvious. The Examiner further states that Gulotti teaches a composition that overlaps claim 2.

The Examiner further asserts that claims 1-6 are anticipated or rendered obvious by Azuma, which teaches an extruded AlMgSi component containing Mg_2Si particles from pre-ageing treatment, and thus would anticipate the limitation that Mg and Si particles are present to prevent artificial ageing. The Examiner also asserts that any difference between the claimed invention and Azuma is minor and would have been obvious. The Examiner also asserts that Azuma teaches a composition that overlaps claim 2, and teaches elements in amounts that overlap claims 3-6 and 8-9.

The Examiner additionally has rejected claims 1-9 as anticipated by or obvious over Yoshihara. The Examiner states that Yoshihara teaches a high strength extruded AlMgSi component containing Mg_2Si particles and thus would anticipate the limitation that Mg and Si are present as the claimed particles to prevent artificial ageing. In the alternative, the Examiner contends that any difference between Yoshihara further teaches a compound that overlaps the compounds of claim 2-9.

First, applicants note that all of the references cited by the Examiner relate to a completely different technical field. Extrusion technology is quite different from sheet processing (hot rolling) and a person of ordinary skill would of course not be informed by documents dealing with extrusion processing, or see therein any useful information on how to make rolled sheet. Further, it is evident that none of the citations listed by the Examiner relates to sheet metal automobile body parts.

Applicants also maintain that extrusion is a remarkably more severe form of hot deformation than hot rolling. Extrusion normally takes place in a single pass, whereas hot rolling is done in a series of passes. Extrusion normally takes place at a temperature below the solution heat treatment temperature, but the amount of deformation that goes into the extrusion billet causes it to heat up further, and the extruded billet can often reach a solution heat treatment temperature. As the extrudate emerges from the die it can be allowed to cool in air (which would be faster and equivalent to a quench if the extrudate has a small cross-section), or it can be quenched as it emerges from the die (a term known as press-quenching), or it can be removed quickly to a quenching station. After that, the extrudate is then given an ageing

treatment in order to develop its optimum properties.

Warblicher relates to a heat treatment process designed to promote the formation of fine precipitates through a homogenization process. Warblicher describes a typical homogenization and slow cooling treatment. The precipitates of magnesium and silicon that evolve are, therefore, coarse ones. Warblicher also performs an interrupted cooling process in which the material is quenched down to a temperature between 230 and 270°C, at which point there is a holding period. This appears to result in finer particles based on MgSi.

However, the Warblicher process also requires a reheating of the extrusion ingot or billet prior to extruding, a subsequent extruding step, and a further coolingdown of the extruded material. Then, the extruded material undergoes an ageing step to develop the desired strength. Although these process steps are not explicitly disclosed in Warblicher, a person of ordinary skill would understand the need to reheat the billet in view of the intermediate cooling step in this reference.

The difference in the processing route according to the invention is, as Warblicher states (column 1, line 35 onwards) that the fine particles after the special cooling process do not completely go into solution during the extrusion step. But, they can be effective as a nucleus for the precipitation. In other words, the a person of ordinary skill would expect from that there will be significant precipitation strengthening occurring in later process steps.

Summarizing the above, Warblicher teaches control of magnesium and silicon particles in order to promote extrudability, whereas the present invention deals with the

control of these particles in order to limit the extent of artificial ageing. As a consequence, applicants respectfully disagree that Warblicher renders obvious or anticipates the claimed invention.

Yoshihara just discusses normal processing conditions for aluminum-magnesium-silicon extrudate (for example, para . [00 29]). Yoshihara states that the extrudate is "subjected to an ageing treatment to precipitate Mg_2Si in the grains." The tensile strength data in Table 3 of Yoshihara show high-strength levels, which in turn would not be possible if there had been little or no artificial ageing. Therefore, the person of ordinary skill would not see anything in Yoshihara suggesting a significant portion of magnesium or silicon particles to be retained in a form that renders these elements unavailable for subsequent precipitation strengthening.

Azuma likewise is irrelevant to the present invention. Azuma addresses the precipitation of Mg_2Si through ageing treatments, rather than avoiding or limiting such precipitation in a manner according to the invention.

Timm seeks to optimize the precipitation of Mg_2Si through ageing treatment. Again, Timm does not attempt to avoid the ageing treatment, but rather tries to optimize it by use of Mg_2Si precipitation. This, however, does not render the invention as claimed in any of the rejected claims obvious.

Turning to Gulotti, applicants maintain that it adds little to the mix. It involves homogenization wherein the first homogenization is performed above the solvus temperature and the second homogenization is performed below the solvus temperature. In effect, Gulotti teaches a homogenization process followed by a

homogenization process. As a result of this process route, the Mg_2Si particles are relatively large, and would be similar to the microstructure shown in picture 4 of Fig. 155 attached hereto **(Exhibit A)**.

However, the ability to deform an extrusion billet is largely dependent on the strength of the billet at the extrusion temperature. Since extrusion takes place at a high temperature where the elements can redissolve from the precipitates into the solid solution, the strength of the extrusion billet is due to solute strengthening. This double homogenization process known from Gulotti, therefore, appears to be an attempt to reduce the amount of solute in solid solution by having larger precipitates that do not completely re-dissolve at the extrusion temperature (see Gulotti, col. 4, line 7).

Nevertheless, as the examples in Gulotti show, the mechanical properties are such that significant ageing takes place after subsequent processing. As Example III states: "These mechanical properties clearly show that the extrusion procedure of the present invention exceeds the strength requirements for Alloy 6061-T6 temper."

The skilled artisan knows that the T6 temper is an industry standard term which is used to represent alloys that have been solution heat treated and then aged, usually to their maximum strength. Consequently, the skilled person would consider this document disclosing a final extruded product in which the vast majority of Mg_2Si precipitates are present as precipitates that have been developed during the ageing process. Although the material resulting from the Gulotti process might have some pre-precipitates present, the most substantial proportion must be present in the form of precipitates developed during the ageing treatment. This effect, however, is in direct

contrast to the present invention where the aim is to avoid artificial ageing of the alloy. Thus, Gullotti teaches away from the claimed invention in that it advocates ageing to incrase precipitates and thus billet strength, while the present invention avoids ageing in a hot rolling process to increase shoe and strength.

Therefore, applicants maintain that none of the cited references renders, whether taken singly or in combination, the claimed invention obvious. Furthermore, a person of ordinary skill would not have been motivated to gain any information or hint to optimize sheet processing processes by adopting or modifying features known from references relating to extrusion processes. The invention defined in claims 1 to 11 currently pending is, therefore, both novel and non-obvious over the references cited.

The Director is authorized to charge any fee required in connection with this response to Deposit Account No. 03-3125. If any extension is required in connection with the filing of this response, applicants hereby request same and authorize the fee therefor to be charge to Deposit Account No. 03-3125.

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Respectfully submitted,

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EXHIBIT A

To
Amendment

(U.S. SERIAL NO.: 10/578,985)

Heat Treating Operations

For age hardening, the heat treatment is carried out in three successive steps.

1. Solution-heat-treatment at a temperature above the solubility curve. For extrusions, a separate solution-heat-treatment is often unnecessary, since the freshly extruded shape already has a temper and condition which corresponds to that of a solution-heat-treated piece.
2. Quenching, usually in water, sometimes in air. Castings are also quenched in heated oil to reduce quench stresses.
3. Aging (precipitation) at room temperature (natural aging) or at elevated temperatures up to 200 °C (artificial aging).

The three steps as a function of time are represented in Figure 154 for alloy AlCuMg2 (AA2024).

For a given alloy the age hardenability, as well as the temperature range for the solution-heat-treatment, can be determined from the lower part of the equilibrium diagram which shows the solid state.

In the following section, the steps taken during heat treatment are considered along with the changes observed in the structure.

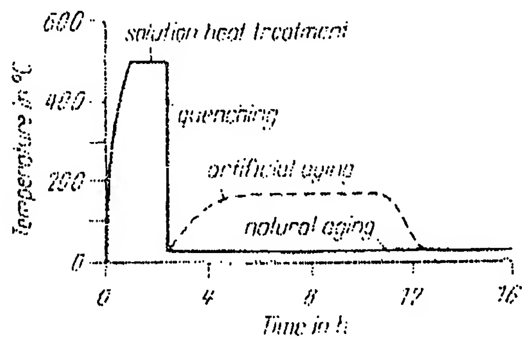

Figure 154: Schematic showing age-hardening of AlCuMg2 (AA2024).

Survey of Structural Conditions

The states through which the structure of a heat-treatable alloy passes from casting to heat treatment are presented schematically in Figure 155 for the Al-Cu system.

The sequence is as follows:

1. All metal is liquid.
2. Liquid is located between the primary crystals. This structure also results from overheating during solution-heat-treatment, if the temperature of the treatment accidently exceeds the solidus temperature.
3. Homogeneous structure which is obtained by solution-heat-treatment at 520 °C, for example, and subsequent rapid quenching.

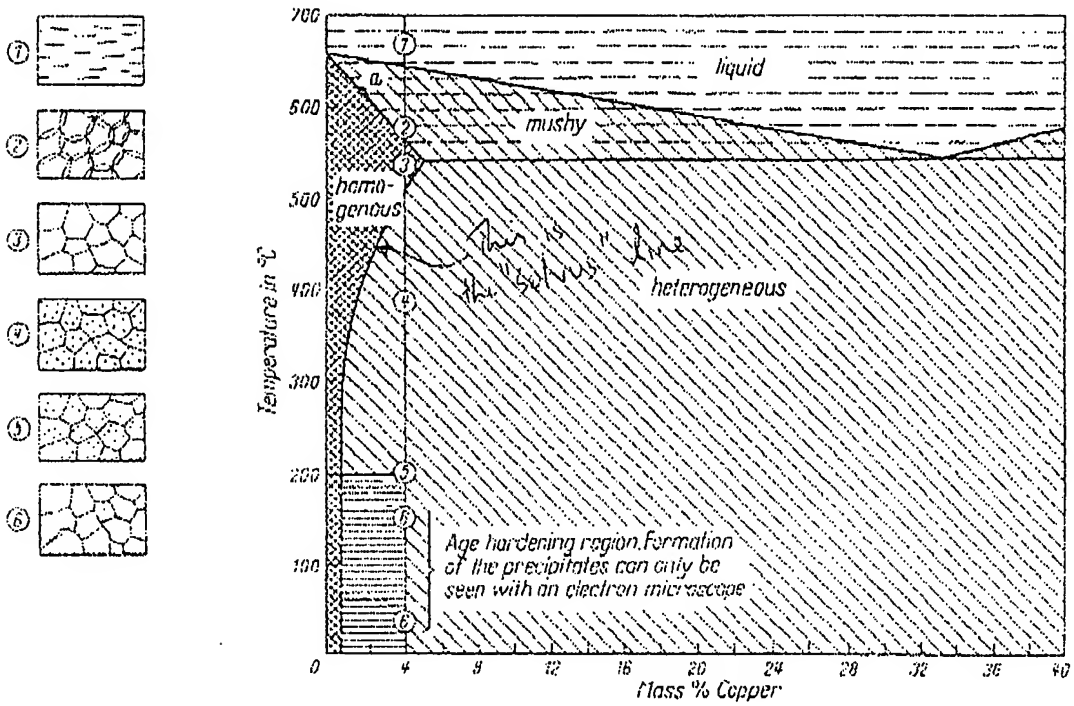

Figure 155: Relation between the equilibrium diagram and structure for the aluminum-copper system. The schematic representation of the structure is for a 4% copper content.

4. This structure forms from the homogeneous structure by annealing at 400 °C. A relatively coarse precipitate of a copper-rich phase ($CuAl_2$) forms. The fully annealed condition is obtained by this "heterogenization".
5. Structure after precipitation at approximately 200 °C (heterogenization). This structure is obtained if the aging temperature is too high so that copper precipitates of medium size are formed. Such a structure is undesirable, because it reduces the corrosion resistance and the mechanical properties compared to Structure 6. Nevertheless, it is much harder than Structure 4.
6. Structure of the fully aged alloy. This structure is obtained as follows. First of all, a homogeneous structure is obtained by solution-heat-treatment. The material is then quenched as rapidly as possible in water (Structure 3). If the quench rate is too slow, visible precipitates will begin to form, i.e., the undesirable Structure 5. The rapidly quenched structure shows no precipitation even after aging, under the microscope. (Precipitates containing iron and manganese are an exception, but they have little effect in the heat treatment.)